

Daytime Multilayered Cloud Detection With MODIS

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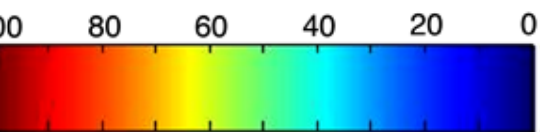
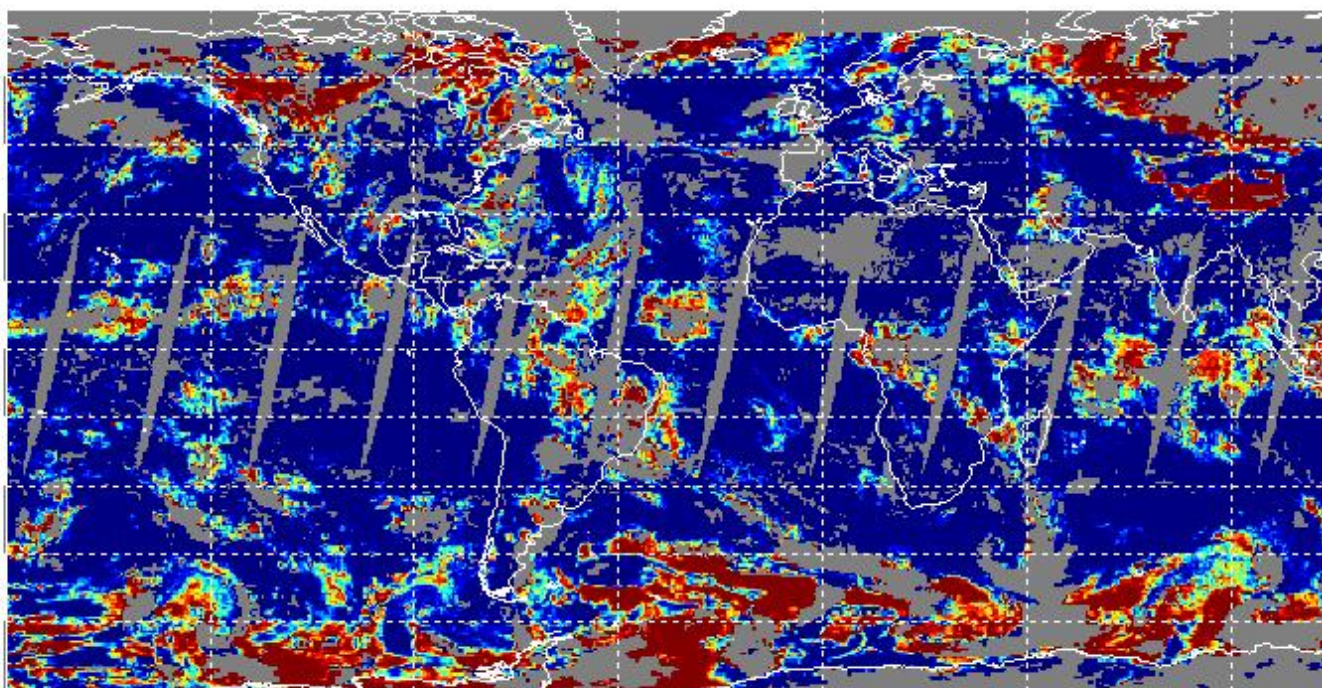
Dep't of Atmospheric and Oceanic Sciences
University of Wisconsin-Madison



*CERES Science Team Meeting
May 14-16 2002*

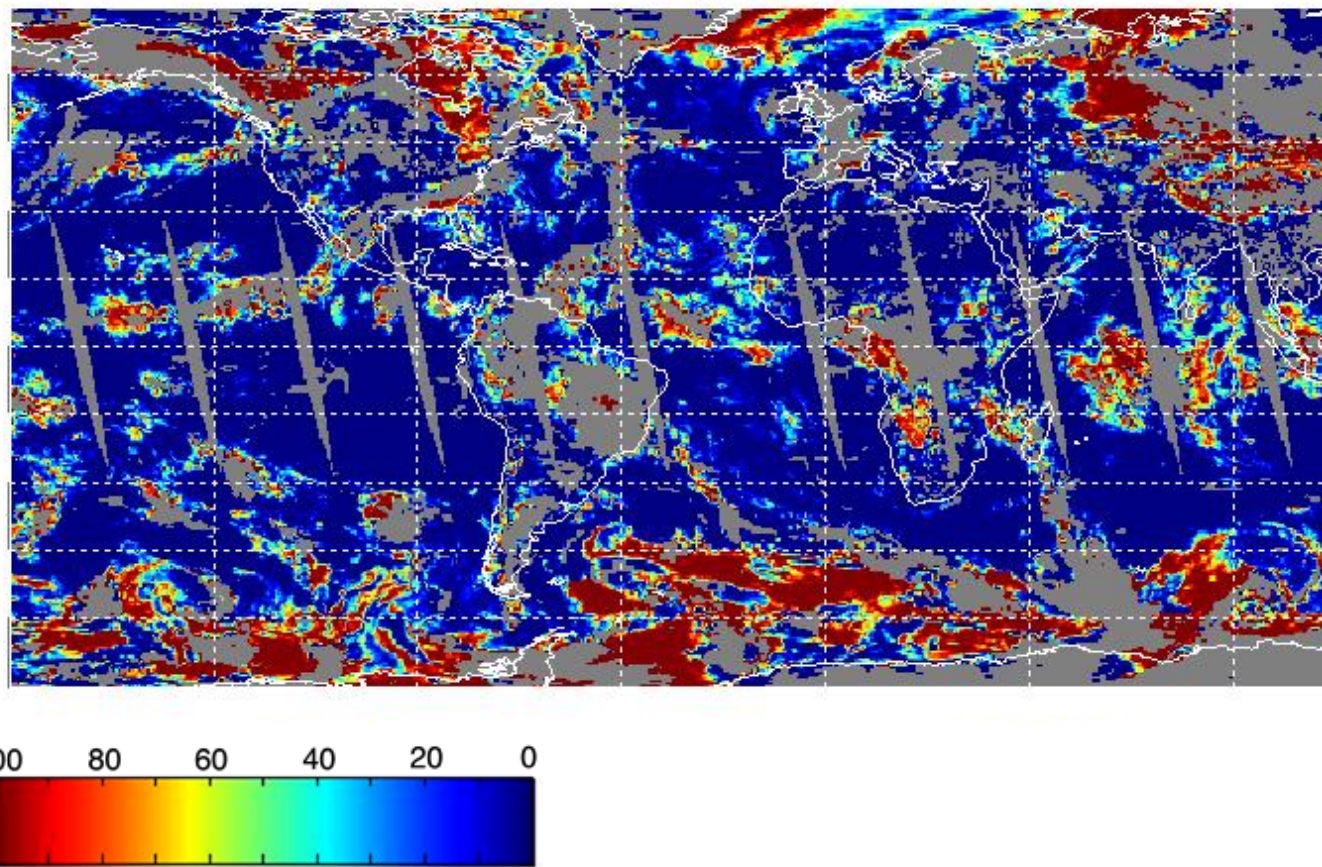


MODIS Frequency of Co-occurrence
Water Phase with $253\text{ K} < T_{\text{cld}} < 268\text{ K}$
05 Nov. 2000 - Daytime Only



Frequency of occurrence in percent (%)

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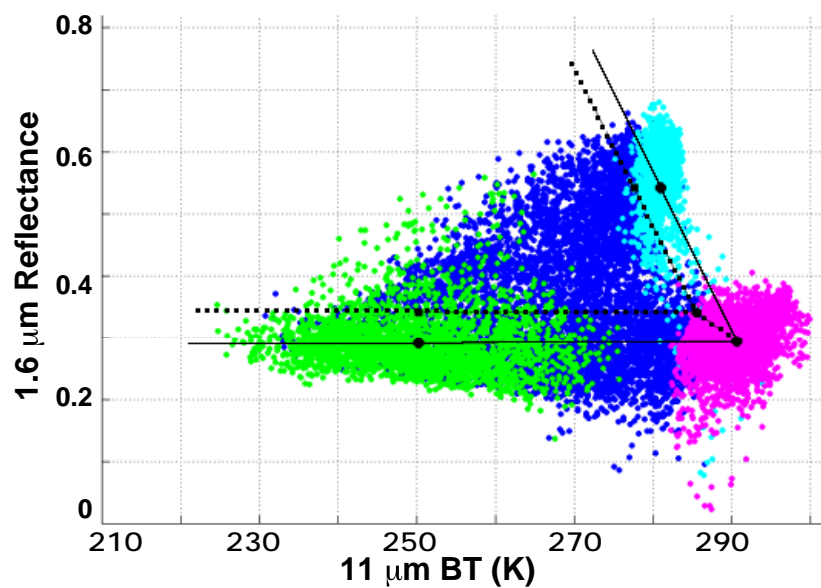
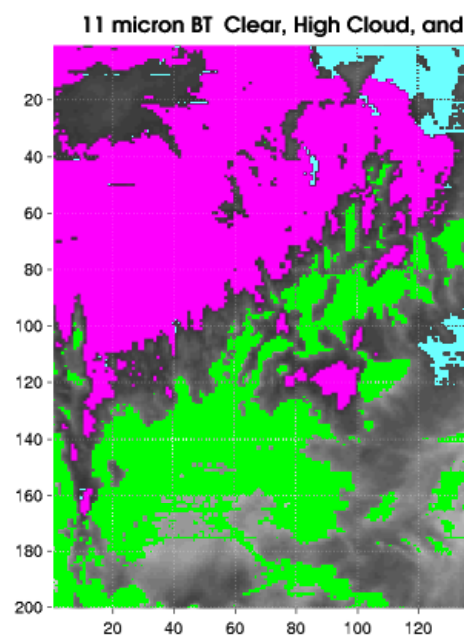
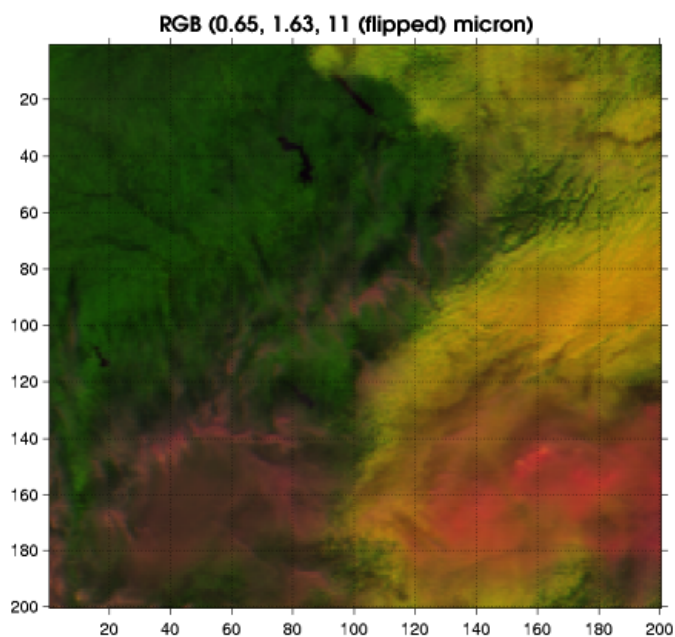
MODIS Daytime Cloud Overlap Technique

Assumption: At most 2 cloud layers in data array

For a 200x200 pixel (1km resolution) array of MODIS data:

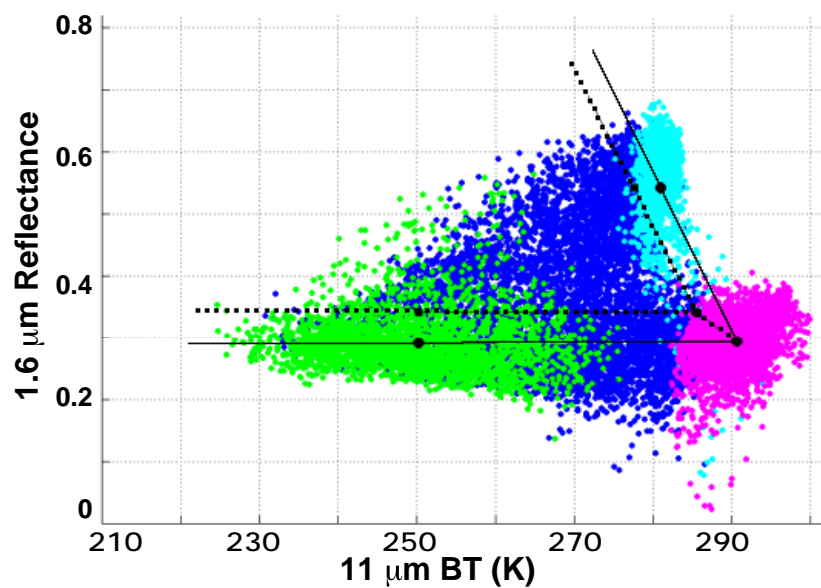
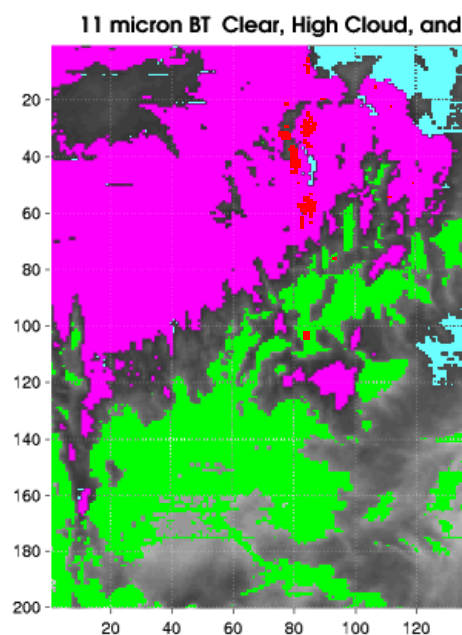
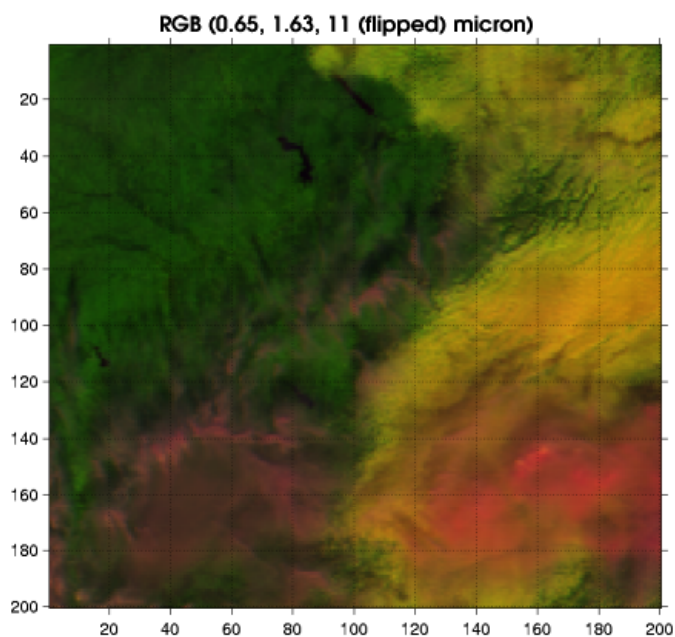
- Identify clear pixels from MODIS cloud mask
- Identify unambiguous ice pixels and water pixels from 8.5- and 11- μm bispectral cloud phase technique
- Classify unambiguous ice/water pixels as belonging to the higher/lower cloud layer
- Classify remaining pixels as overlapped

200 by 200 pixels of MODIS Data from 15 Oct. 2000 at 1725Z



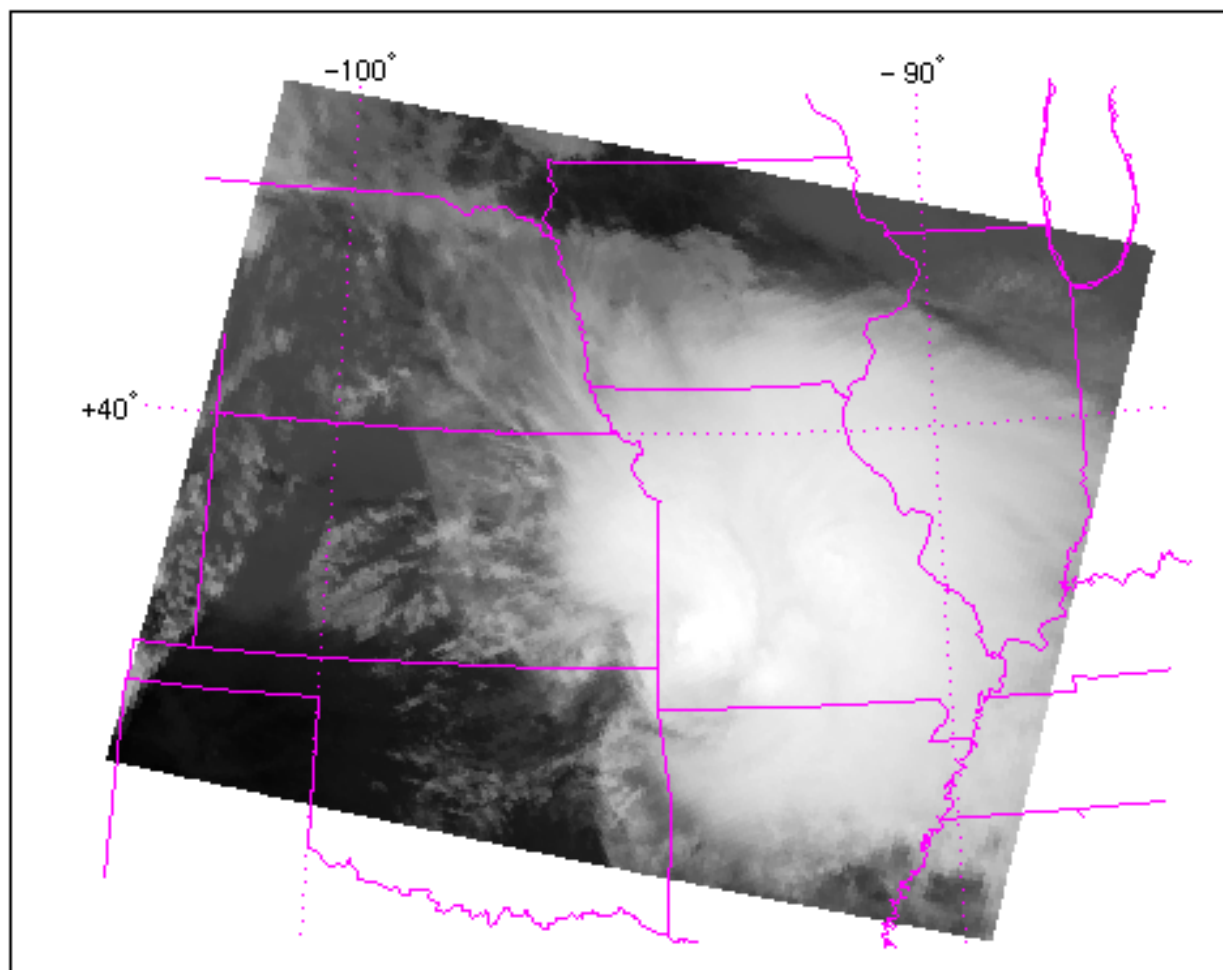
- Water Cloud (from MODIS Phase)
- Ice Cloud (from MODIS Phase)
- Clear (from MODIS Cloud Mask)
- Other (to be determined)

200 by 200 pixels of MODIS Data from 15 Oct. 2000 at 1725Z



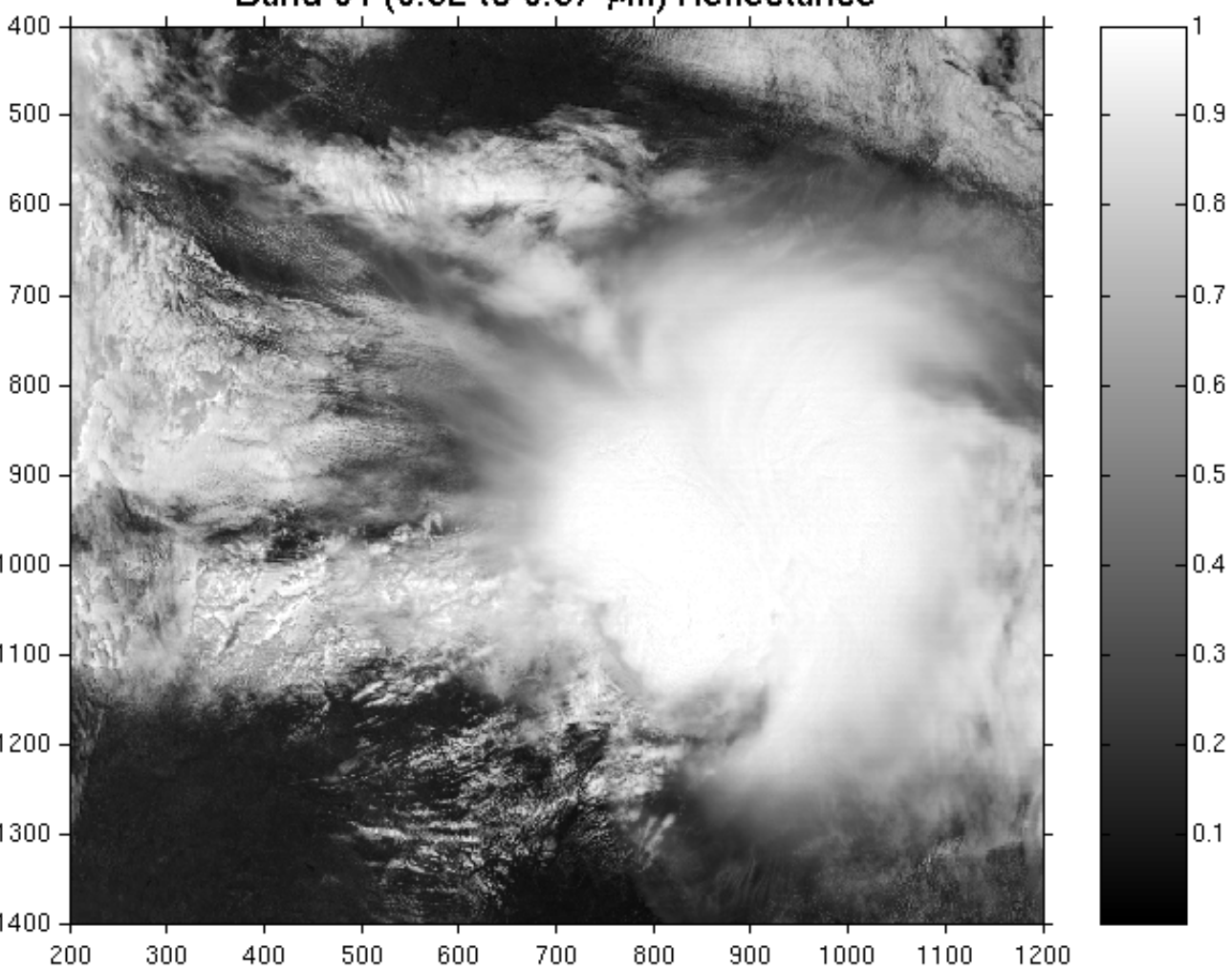
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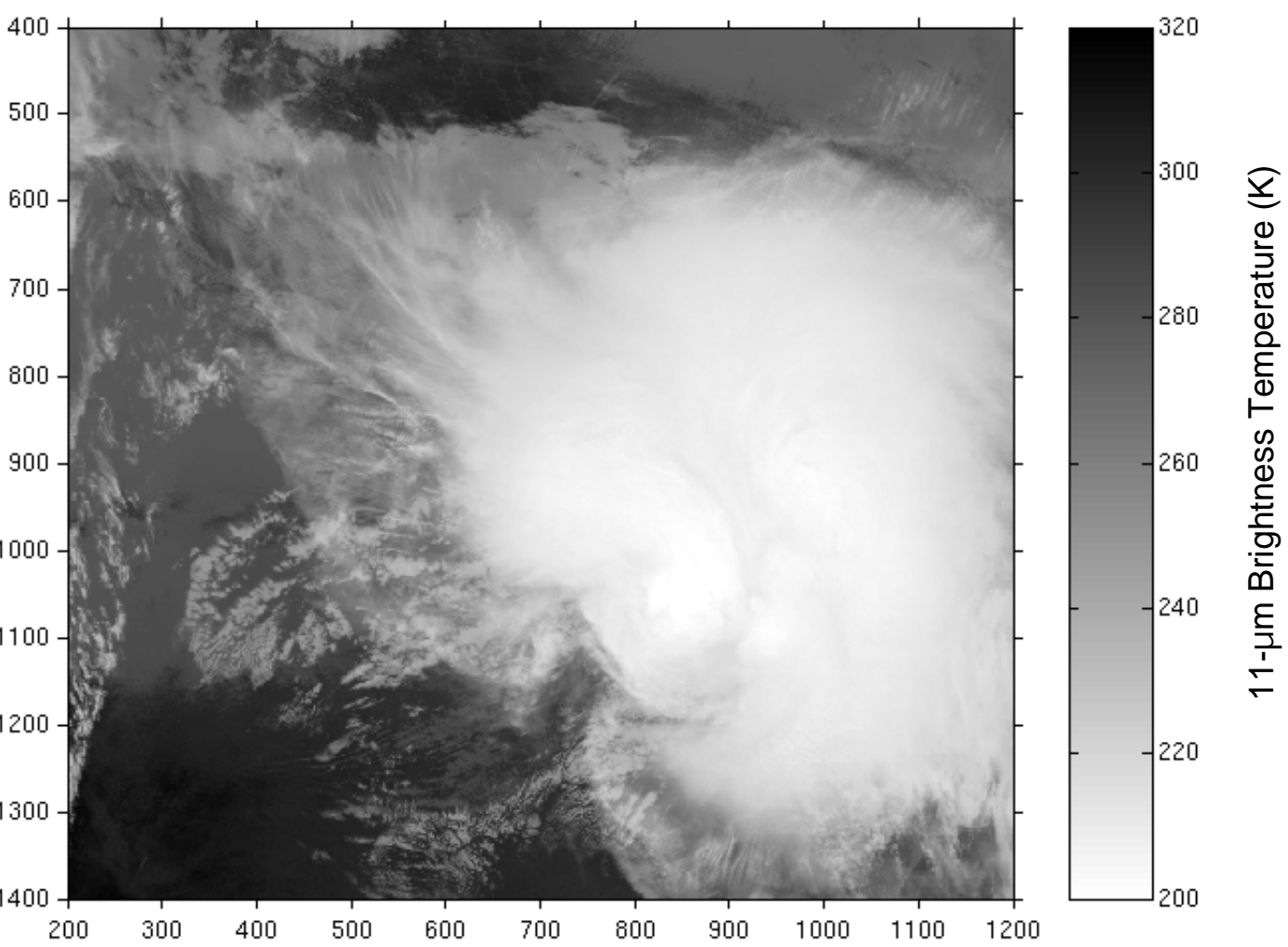
MODIS Band 31 (11 μm) on 3 June 2001

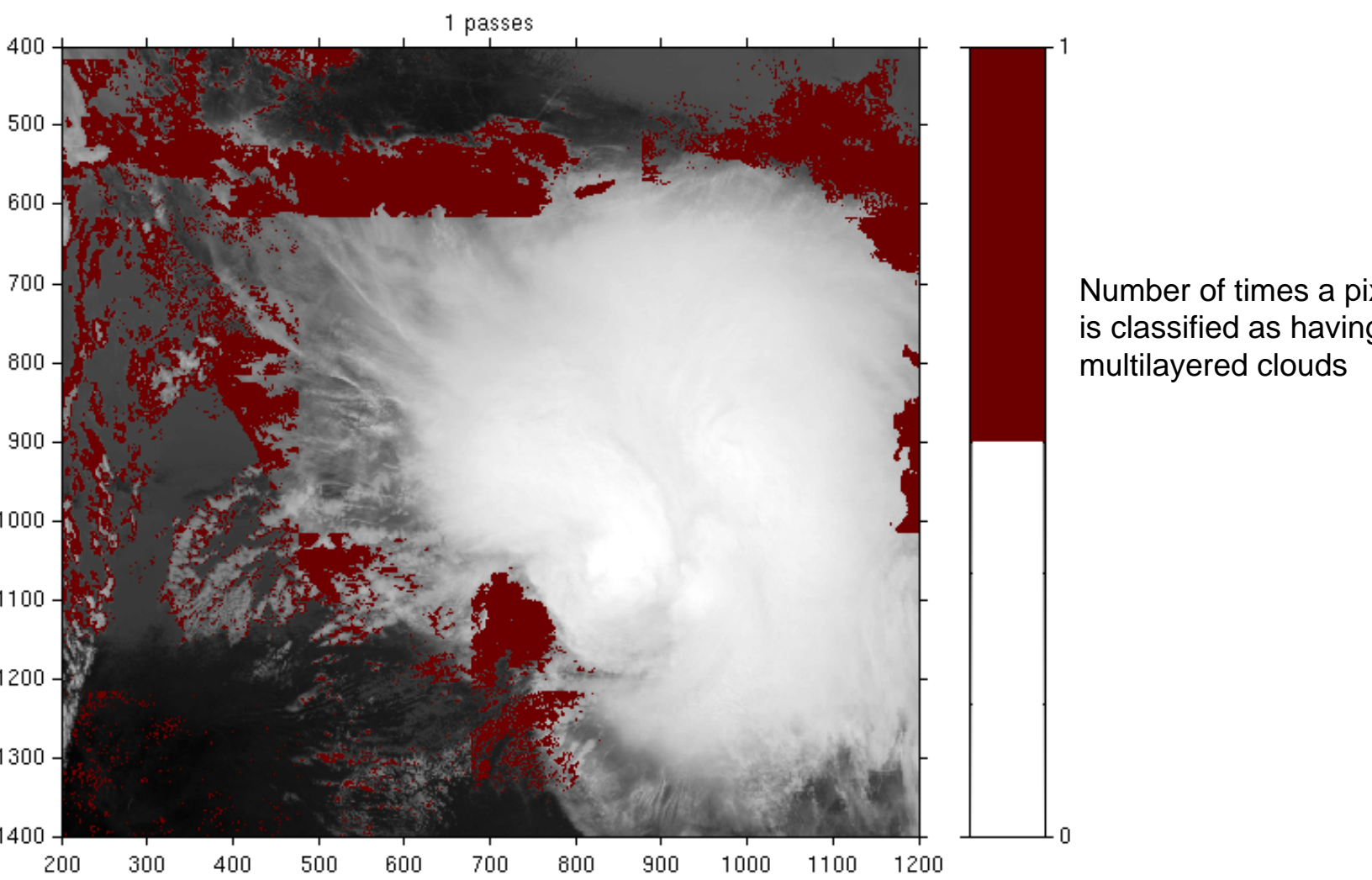


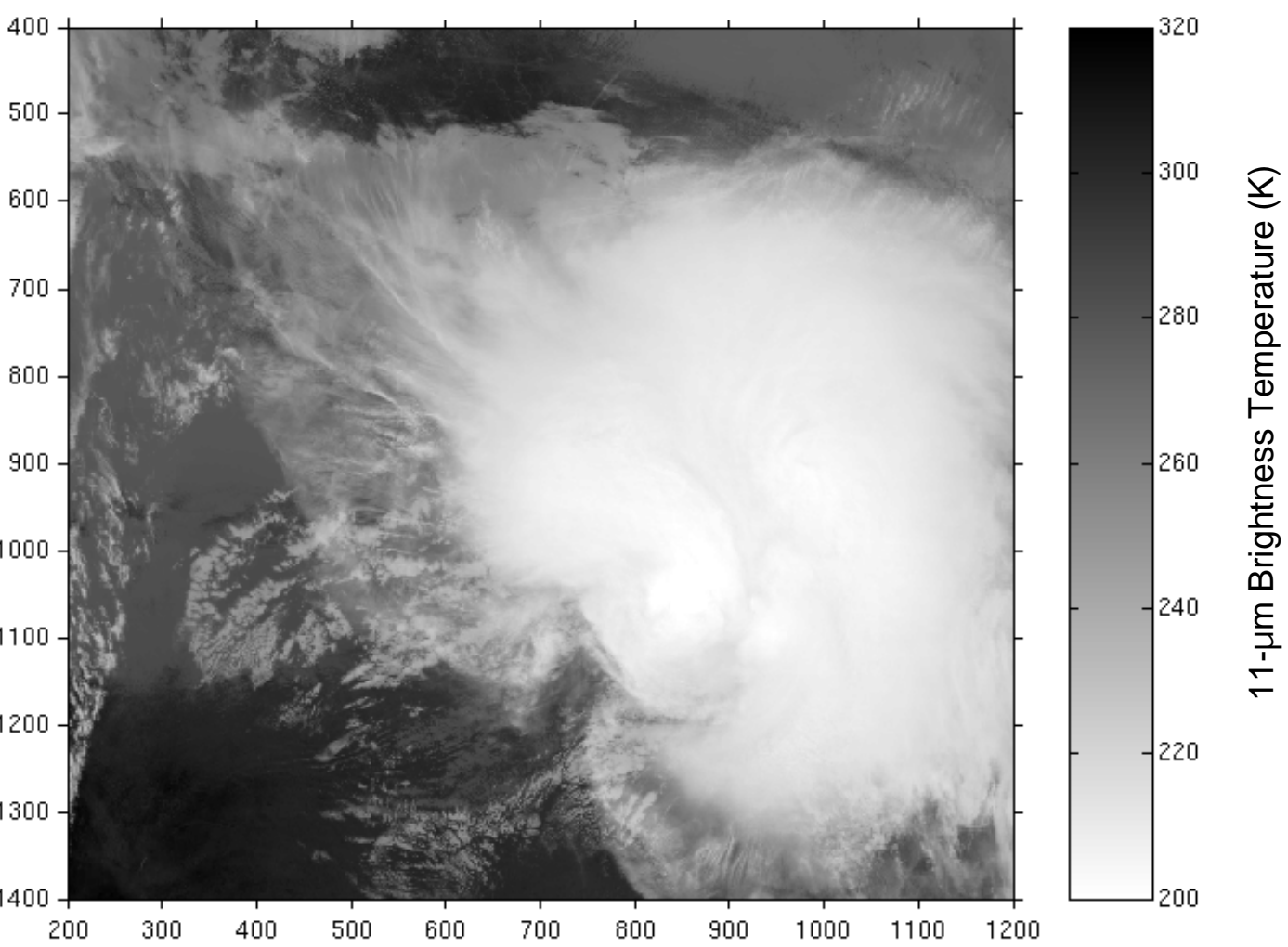
Brightness Temperature (K)

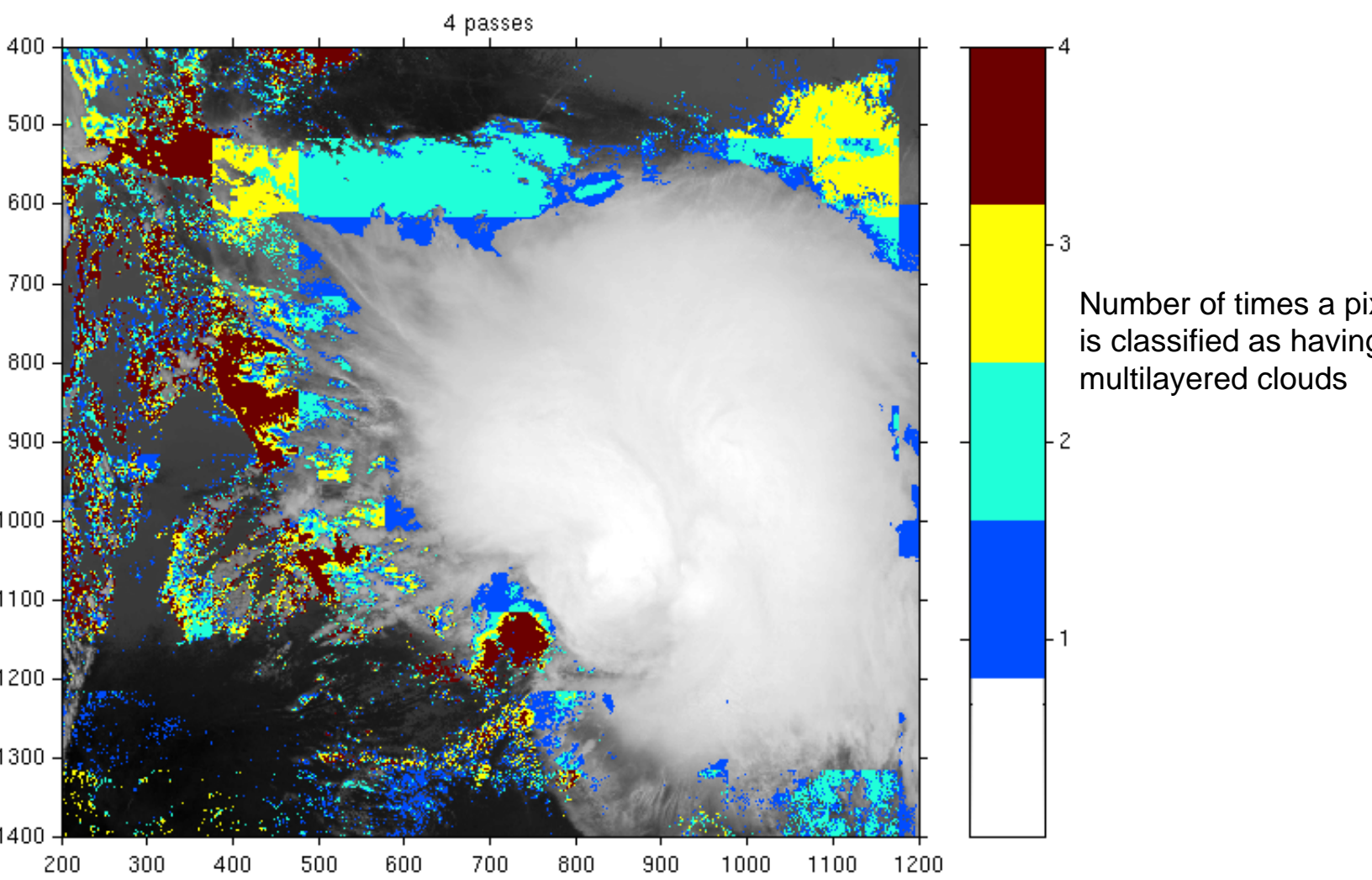
Band 01 (0.62 to 0.67 μm) Reflectance

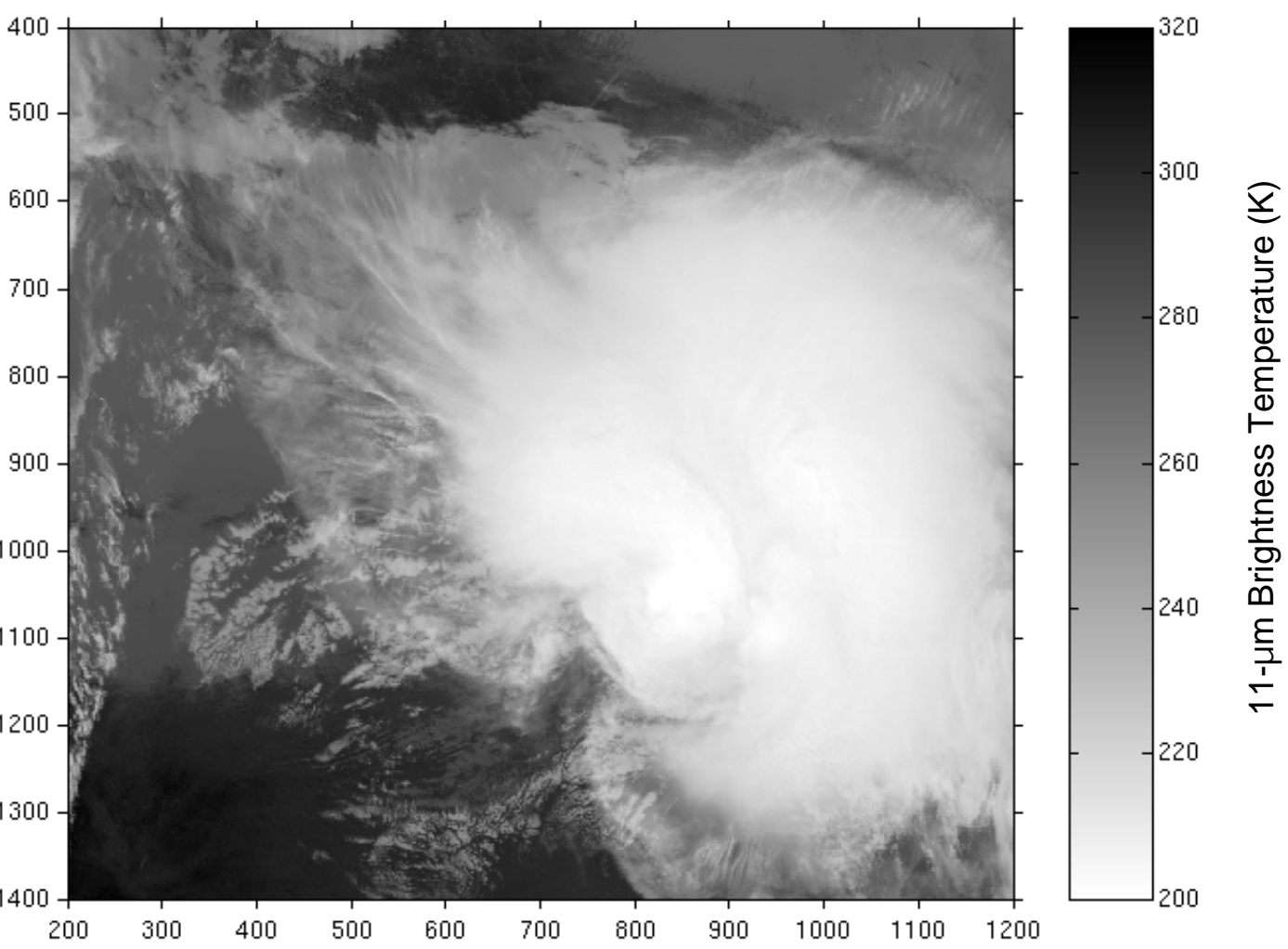


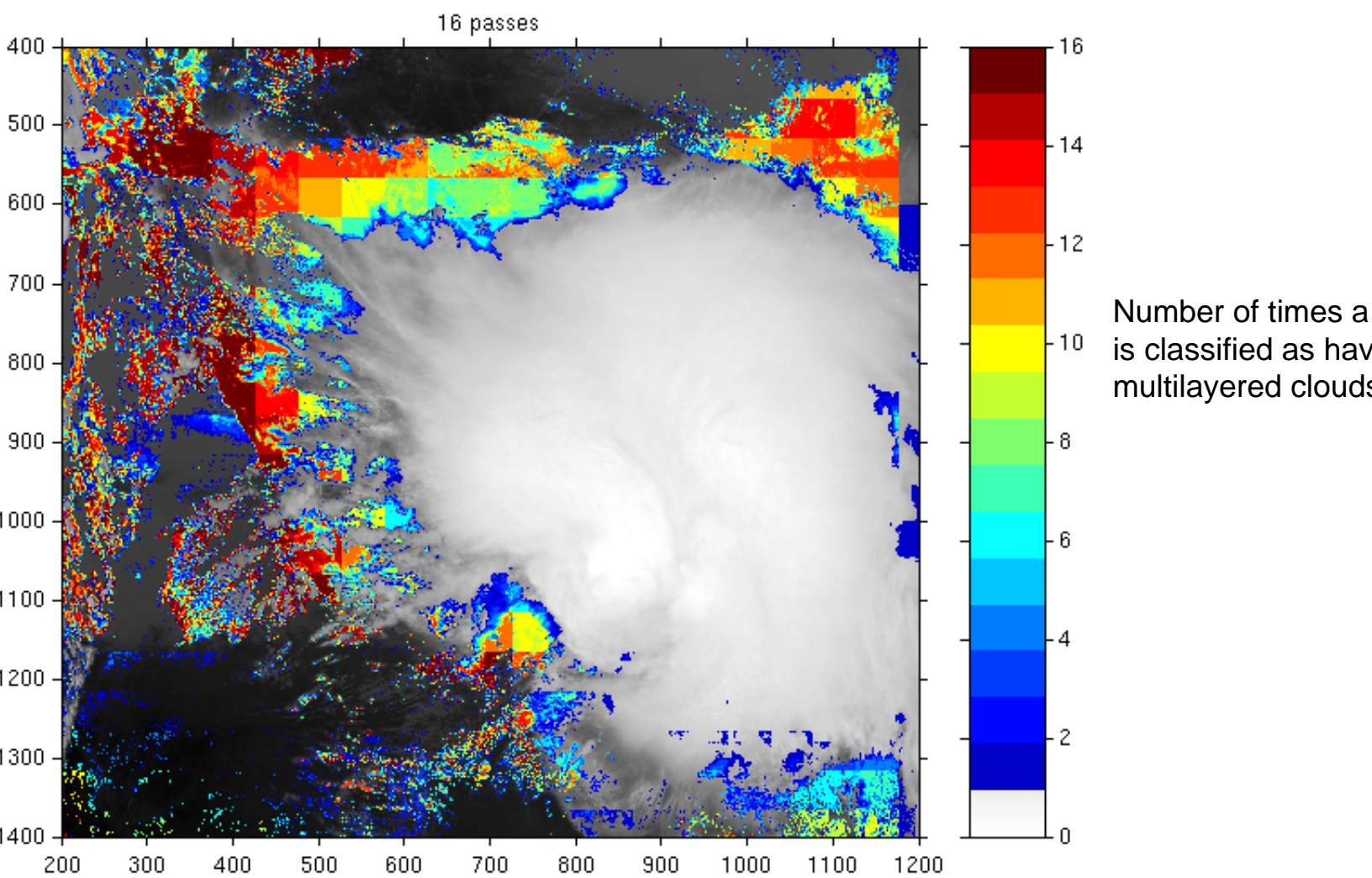


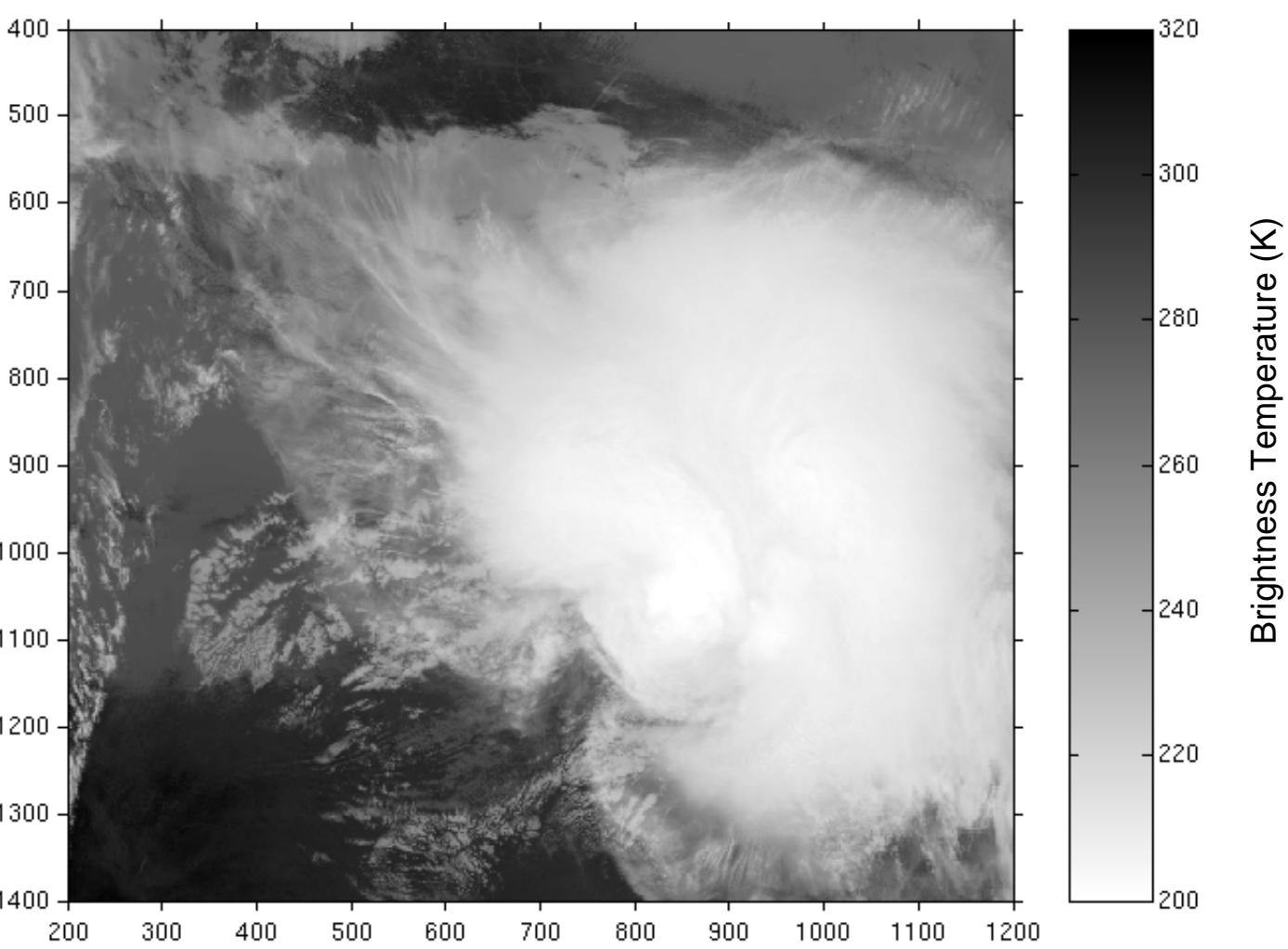


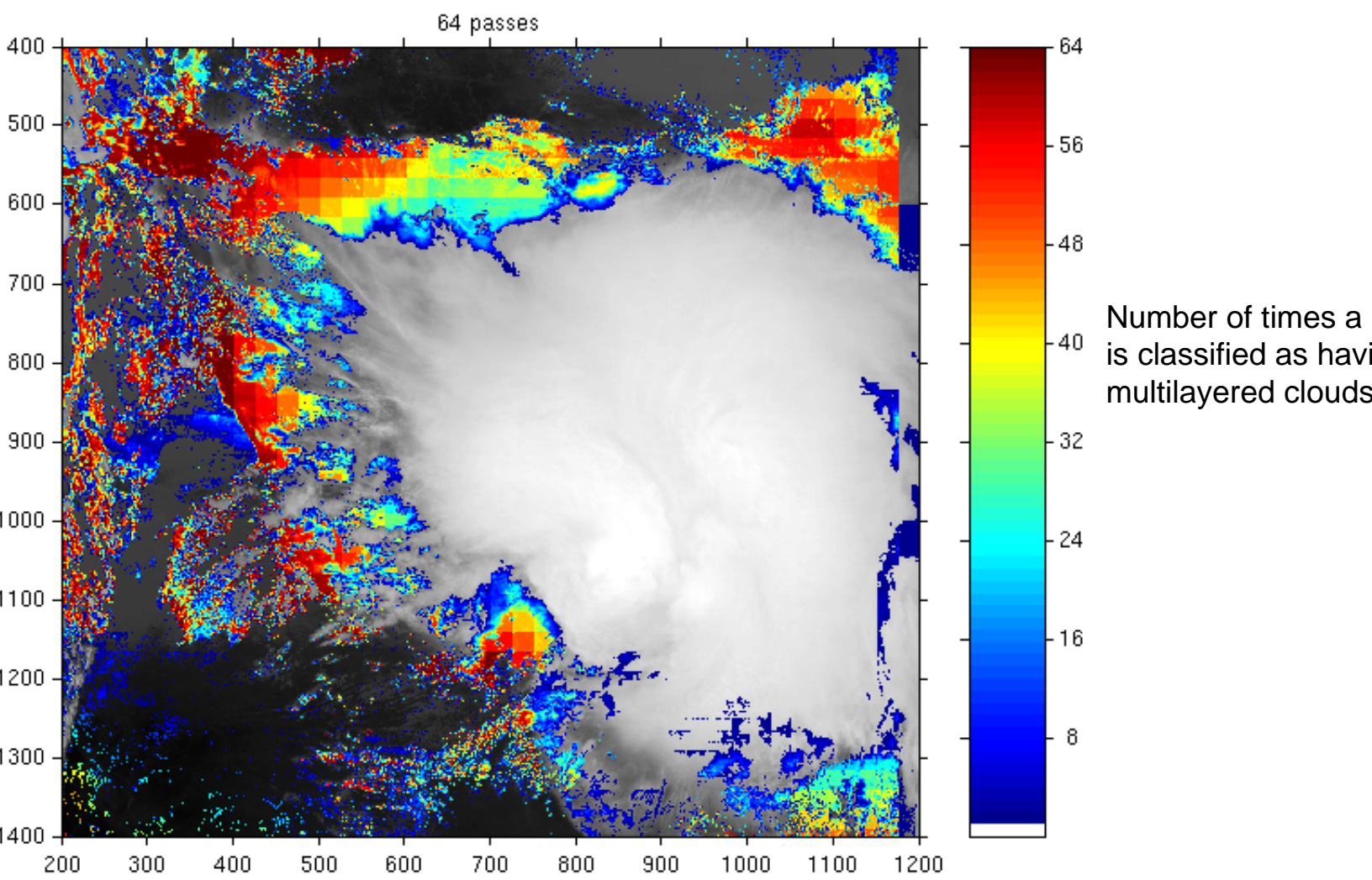


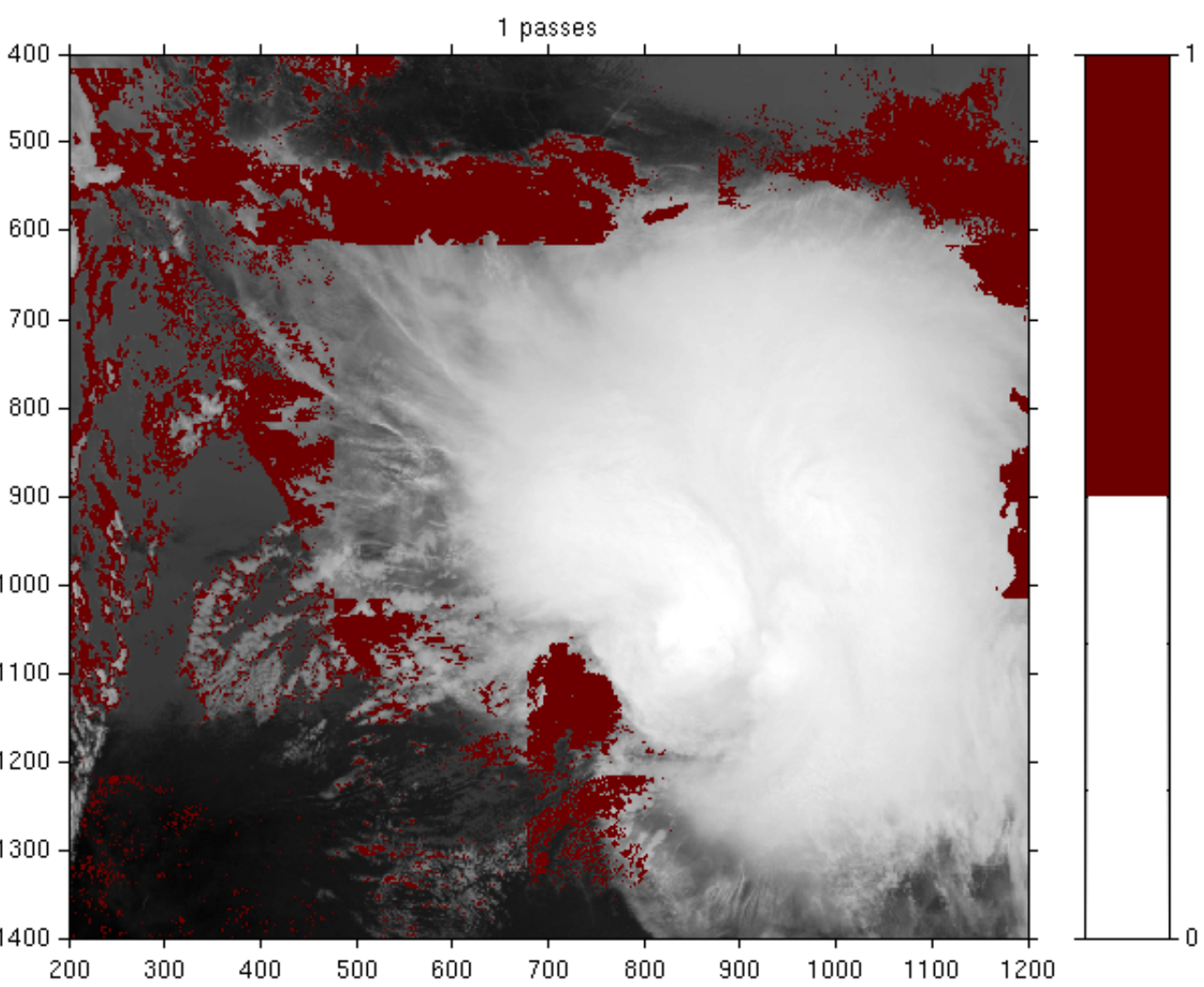












Where are we taking this?

Currently, software to process MODIS granule is
based on the Matlab COTS product
- requires cloud clearing and cloud phase products

Will apply this approach to daytime MODIS direct broadcast
data for both Terra & Aqua

Once method becomes more settled, it will be adapted for
operational environment

EOS Direct Broadcast at SSEC

Objective: Routine acquisition and processing of EOS direct broadcast data (NASA HQ funding).

- As of April, 2002 had acquired and archived over 2500 Terra MODIS passes.
- Level-1B data and browse images are have been produced automatically in near realtime; available via anonymous FTP, DODS server, and Web.

<http://eosdb.ssec.wisc.edu/modisdirect/>

- IMAPP software for processing MODIS direct broadcast now used in USA, UK, Norway, Germany, Russia, Japan, China, Korea, Singapore, Australia, Vietnam.

International MODIS/AIRS Processing Package

Goal: Transform direct broadcast Level-0 data (initially from MODIS, then AIRS/AMSU/HSB) to calibrated & geolocated radiances (Level-1) and science products (Level-2).

Features:
ported to a range of platforms (IRIX, SunOS, AIX, HP/UX, Linux),
the only tool kit required is NCSA HDF4,
source code freely available (licensed under GNU GPL),
latest MODIS Level-1 release (v 1.3) on December 3, 2001,
latest MODIS Level-2 release (v 1.1) on May 1, 2002.
AIRS/AMSU/HSB Level-1 processing available by end of 2002.

<http://cimss.ssec.wisc.edu/~gumley/IMAPP/>

And in summary...

To improve inference of cloud phase, we are attempting to separate single-layered from multilayered clouds.

The Direct Broadcast data will be used to test the new approach on a daily basis.

When the method becomes more mature, it will be modified for operational use.

Future field experiments will provide (hopefully) cloud phase independently from depolarization lidar measurements from above cloud top for cloud phase and multilayered cloud comparisons.